



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION II  
SAM NUNN ATLANTA FEDERAL CENTER  
61 FORSYTH STREET SW SUITE 23T85  
ATLANTA, GEORGIA 30303-8931

April 17, 2001

South Carolina Electric & Gas Company  
ATTN: Mr. Stephen A. Byrne  
Vice President, Nuclear Operations  
Virgil C. Summer Nuclear Station  
P. O. Box 88  
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION REACTOR COOLANT SYSTEM  
(RCS) HOT LEG WELD CRACK MEETING SUMMARY

Dear Mr. Byrne:

This refers to the meeting conducted at your request at the V. C. Summer facility near Jenkinsville, South Carolina, on January 18, 2001. The purpose of the meeting was to discuss activities associated with the crack discovered in the A RCS hot leg weld. At the meeting, your staff presented an informational overview of: the pipe repair, your root and contributing cause evaluations, the extent of condition reviews and activities, safety margins maintained and future planned actions. In addition, Messrs. J. Strosnider, K. Wichman and B. Crowley, from the NRC, presented slides concerning the NRC special inspection team status, safety evaluation overview, and subjects for industry generic consideration. A list of attendees and the presentation handouts are enclosed.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosures will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/NRC/ADAMS/index.html> (the Public Electronic Reading Room).

Sincerely,

/RA/

Kerry D. Landis, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Docket No. 50-395  
License No. NPF-12

Enclosures: 1. List of Meeting Attendees  
2. Licensee Presentation Handouts  
3. NRC Presentation Slides

cc w/encls: See page 2

cc w/encls:

R. J. White  
Nuclear Coordinator Mail Code 802  
S.C. Public Service Authority  
Virgil C. Summer Nuclear Station  
Electronic Mail Distribution

J. B. Knotts, Jr., Esq.  
Winston and Strawn  
Electronic Mail Distribution

Henry J. Porter, Assistant Director  
Div. of Radioactive Waste Mgmt.  
Dept. of Health and Environmental  
Control  
Electronic Mail Distribution

R. Mike Gandy  
Division of Radioactive Waste Mgmt.  
S. C. Department of Health and  
Environmental Control  
Electronic Mail Distribution

Greg H. Halnon, General Manager  
Nuclear Plant Operations (Mail Code 303)  
South Carolina Electric & Gas Company  
Virgil C. Summer Nuclear Station  
Electronic Mail Distribution

Melvin N. Browne, Manager  
Nuclear Licensing & Operating  
Experience (Mail Code 830)  
Virgil C. Summer Nuclear Station  
Electronic Mail Distribution

SCE&G

3

Distribution w/encls.:

W. Dean, NRR  
K. Cotton, NRR  
PUBLIC

E-mail w/encls.:

Ramin Assa, NRR/LPD2

PUBLIC DOCUMENT (circle one): YES NO

OFFICE	RII	RII	RII	RII	RII		
SIGNATURE							
NAME	LGarner						
DATE	4/16/2001	4/ /2001	4/ /2001	4/ /2001	4/ /2001	4/ /2001	4/ /2001
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

OFFICIAL RECORD COPY

DOCUMENT NAME: C:\Weld crack mtg summary 01 1-.wpd

## LIST OF MEETING ATTENDEES

Topic: VIRGIL C. SUMMER NUCLEAR STATION ALPHA HOT LEG EVALUATION AND REPAIR

Location: Virgil C. Summer Nuclear Station, Jenkinsville, South Carolina

Date: January 18, 2001

### **NRC - Region II**

Luis Reyes	Regional Administrator
Harold Christensen	Deputy Director, Division of Reactor Safety (DRS)
Kerry Landis	Chief, Reactor Projects Branch 5, DRP
Malcolm Widmann	Senior Resident Inspector, V. C. Summer
Mark King	Resident Inspector, V. C. Summer
Billy Crowley	Senior Reactor Inspector, DRS
Ed Girard	Senior Reactor Inspector, DRS
Roger Hannah	Public Affairs Officer

### **NRC - Office of Nuclear Reactor Regulation (NRR)**

Karen Cotton, NRR  
Bill Koo, NRR  
Rich Emch, NRR  
Keith Wichman, NRR  
Jack Strosnider, NRR  
Deborah Jackson, Office of Nuclear Regulatory Research  
Gary Janosko, Office of Nuclear Material Safety and Safeguards  
Steve Dingbaum, Office of the Inspector General (OIG)  
Bill McDowell, OIG  
Steven Doctor, Contractor - Pacific Northwest National Laboratory

### **South Carolina Electric & Gas Company (SCE&G) and SCANA**

Stephen Byrne	Vice President, Nuclear Operations, SCE&G
Greg Halnon	General Manager, Engineering Services, SCE&G
Melvin Browne	Manager, Nuclear Licensing and Operating Experience, SCE&G
Bob Waselus	Acting General Manager, Strategic Planning, SCE&G
Ron Clary	SCE&G
Gary Moffatt	SCE&G
Nevale Lorick	SCE&G
Bruce Williams	SCE&G
Ken Nettles	SCE&G
Chris Caston	SCE&G
Bob Whorton	SCE&G
Ted King	SCE&G

Nedra Kersey	SCE&G
April Rice	SCE&G
Richard Lee	SCE&G
Mike Kammer	SCE&G
Pete Krawczyk	SCE&G
Frank Bacon	SCE&G
Dale Byndrick	SCE&G
Susan Reese	SCE&G
Chris Crowley	SCE&G
John Hendrix	SCE&G
Chuck Rice	SCE&G
Chuck Barbler	SCE&G
Leslie Archie	SCE&G
Paul Mothena	SCE&G
Janiet Thiel	SCE&G
Timothy Franchole	SCE&G
Ron McCauley	SCE&G
James Schafer	SCE&G
Terry Rosser	SCE&G
James La Borde	SCE&G
Kirk Weir	SCE&G
Larry Pauly	SCE&G
Marie Hartle	SCE&G
Jerry Weatherford	SCE&G
Carolyn Chatman	SCE&G
Kathy Culp	SCE&G
Donna Railey	SCE&G
Philip Rose	SCE&G
Victor Kelley	SCE&G
Donna Griffin	SCE&G
Brian Duncan	SCANA
Michael D. Cole	SCANA
Jay Williams	SCANA
Cash Love	SCANA
Catherine Taylor	SCANA

**Other Organizations and Members of the Public**

Robin White	Santee Cooper
Jeff Landrum	Electric Power Research Institute(EPRI)
Frank Ammirato	Senior Technical Manager - Non-Destructive Examination, EPRI
Avtar Singh	EPRI
Dave Modeen	Engineering Director, Nuclear Energy Institute
Don Seeger	Westinghouse
Peter Harden, IV	Westinghouse
Dwain W. Alexander	Westinghouse
Bill Chao	University of South Carolina
Greg Gerzen	Exelon Nuclear

Jeffrey Pochler	CEG-CCNPCI
Steve Fyfitch	Framatone-ANP
Richard Smith	Structural Integrity
Dick Mattson	Structural Integrity
Bob Hermann	Structural Integrity
Dick Labott	Structural Integrity
Joe Weicks	Energy Operations
Michael Saporito	Rochester Gas & Electric
Kazuo Sakai	Kansai Electric Power Company
Dan Salter	HGP, Inc
Keiichi Kugimiyu	Mitsubishi Heavy Industries
Yasuhiro Kutomi	Mitsubishi Heavy Industries
Masahiko Toyoda	Mitsubishi Heavy Industries
Michael Robinson	Duke Energy
Karl Seidle	Duke Engineering
Ken Polet	Fluor Global
Mary T. Kelly	League of Women Voters
Amy Gerer	AP
Randy Watts	SCPSC
Michael Gandy	SCDHEC
Corey Meaux	SCDHEC
Thomas McKinney	SCDHEC
Sharon Cribb	SCDHEC
Teresa Toole	
Adele Bloodworth	
John Martin	
William Willoughby	
C. W. Moore	
Laurie Katie	
Lindsey Edson	
Elise S. Moore	
P. C. Sharp	

## SPECIAL INSPECTION TEAM STATUS

- CHARTERED TO REVIEW LICENSEE'S ROOT CAUSE DETERMINATION AND CORRECTIVE ACTIONS
- REVIEWED ACTIVITIES AT SUMMER STATION, WESTINGHOUSE FACILITIES IN SPARTANBURG, SC AND MONROEVILLE, PA
- REVIEWED ORIGINAL CONSTRUCTION RECORDS OF "A" HOT LEG PIPE WELD; WELD MATERIAL; WELDER QUALIFICATION

- OBSERVED ULTRASONIC TEST DEMONSTRATIONS ON MOCKUP AND EXAMINATION OF WELDS IN ALL LOOPS
- REVIEWED PRESERVICE RECORDS FOR ALL SIX NOZZLE WELDS
- REVIEWED PLANS TO REMOVE PIPE SECTION CONTAINING FLAW FOR PRESERVATION
- OBSERVED METALLURGICAL ANALYSIS ACTIVITIES ON THE FLAW

- REVIEWED PRELIMINARY METALLURGICAL EXAMINATION REPORT AND ROOT CAUSE REPORT
- REVIEWED WELDING REPAIR PROCEDURES AND QUALIFICATIONS
- OBSERVED IN PROCESS WELDING AND NONDESTRUCTIVE EXAMINATION
- OBSERVED PRESERVICE INSPECTION OF NEW PIPE SECTION

- REVIEWED LICENSEE'S LEAK DETECTION METHODS AND WALKDOWN PROCEDURES
- REMAINING ACTIVITIES ARE TO REVIEW FINAL REPAIR AND EXAMINATION
- TO DATE THE LICENSEE'S ACTIONS HAVE BEEN EFFECTIVE

**SAFETY EVALUATION OVERVIEW  
OF V. C. SUMMER'S ANALYSIS OF LOOP B AND C  
NOZZLE WELDS (WCAP-15615)**

Keith Wichman, Chief  
Component Integrity Section  
Materials and Chemical Engineering Branch  
Division of Engineering  
Office of Nuclear Reactor Regulation

January 18, 2001

## SAFETY EVALUATION OVERVIEW

- NRR's Division of Engineering Reviewed V. C. Summer's Submittal and Associated Supplemental Information to Determine Operability with Indications in RCS Loops B and C RPV Nozzle to Pipe Welds
- Licensee's Analysis Concluded Indications in Hot Legs B and C Would Satisfy ASME Code Requirements for 2 Cycles of Operation
- Staff's Review Focused on Uncertainties Associated with Key Technical Assumptions (e.g., Initial Crack Length and Depth - Aspect Ratio; Crack Growth Rate - CGR; and, ASME Code-Allowable Stresses -  $S_m$ )
  - Aspect Ratios Based on Inspection Results
  - Empirical CGR Based on Data from Four Sources
  - Code-Allowable Stresses Based on Similar Material

## SAFETY EVALUATION OVERVIEW

- ANL and PNNL Provided Input to Staff Analyses
- Staff's Evaluation of Licensee's Technical Assumptions Found That:
  - Aspect Ratios Are Reasonably Conservative
  - Empirical CGR Did Not Bound All Data Used, and Was Therefore Increased by 50-Percent in Staff's Assessment
  - Using Allowable Stresses Based on Average of Yield and Ultimate Tensile Stresses (Flow Stress) of Alloy 182 More Appropriate than Using Allowable Stress for Alloy 600
- Staff's Evaluation Concludes That V. C. Summer Can Be Operated for One Fuel Cycle with Detected Indications
  - Licensee Committed to Inspect B and C Hot Leg Welds at next Outage with Best Available Ultrasonic Testing Method and to Follow Guidance Developed by Industry Initiative

## SAFETY EVALUATION OVERVIEW

- Future Generic Actions to Be Taken by NRC / Industry
  - PWROG's Material Reliability Program (MRP) Will Meet with Staff on January 25, 2001, to Discuss Industry Initiative to Address Generic Implications of RPV Nozzle to Pipe Weld Cracking
  - Staff Is Not Convinced That Issue Is Summer-Specific and Expects MRP Initiative to Address Generic Implications
  - Staff Is Expecting That MRP Initiative Will Address Concerns Regarding CGR, In-Service Inspection Scope and Scheduling, and Leak-Before-Break Implications, Among Other Issues

# **SUBJECTS FOR INDUSTRY GENERIC CONSIDERATION**

## **I. SAFETY ANALYSIS**

- MARGINS AGAINST FAILURE
- LBB ANALYSES
- RISK ASSESSMENT
- BASES FOR OPERATION

## II. INSPECTION PROGRAM

- SCOPE
  - INTEGRATED INDUSTRY PROGRAM
  - SUSCEPTIBILITY MODELS
  - STATISTICAL / RISK INFORMED APPROACH  
(SAMPLE SIZES, EXPANSION CRITERIA)
  
- TIMING/FREQUENCY
  
- METHODS
  - UT / ET / PT / \_\_\_\_\_
  - NDE PERFORMANCE QUALIFICATION
  - IMPROVED NDE METHODS
  
- ACCEPTANCE CRITERIA - ASME CODE

### **III. FLAW EVALUATION PROCEDURES**

- NDE UNCERTAINTY
- GROWTH RATE DATA
- RESIDUAL STRESS DISTRIBUTIONS  
(CIR vs AXIAL, BI-METALLIC WELDS)

## **IV. LEAKAGE MONITORING**

- LEAKAGE MONITORING TECHNIQUES
- LEAKAGE MONITORING PROCEDURES
- MARGINS (LBB)

## **V. LBB APPROVED PIPING**

- MORE INFORMATION IS NEEDED
- INDUSTRY TECHNICAL / REGULATORY INSIGHTS

## **VI REPAIRS / MITIGATION**

- INDUSTRY INITIATIVE
- VALIDATION
- INVOLVE NRC EARLY WHERE REGULATORY REVIEW / APPROVAL MAY BE NECESSARY